Broad Energy Band XAFS

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1. Introduction

This beamline, BL01B1, of which the light source is synchrotron radiation from a bending magnet, is one of the first ten beamlines available from Autumn in 1997. Wide research regions of XAFS in a state of equilibrium will be covered with high quality. The beamline optics and the experimental alignment have been designed. The important parameters of the beamline are given in Table 1 . All in the Table 1 are the values at the sample position.

Table 1 . The specification of the beamline.

Energy range	3.5 ~ 90keV
Energy resolution	4×10^{-4}~1×10^{-4}
Photon flux	10^{10}~10^{12}Phs/s
Higher harmonics	$< 10^{-5}$
Beam size	0.2~0.3 mm^2

2. Outline of the optics

To achieve above characteristics , the optics is arranged as shown in Fig. 1 . The first mirror coated by Rh works as vertical collimator and to eliminate the higher energy harmonics. The monochromator is designed specially for the bending magnet source. The wide energy range is covered owing to rotating the crystal axis, and it has a function of sagittal focusing (3:1). The second mirror also coated by Rh is active for vertical focusing (7.5:1) and high energy harmonics elimination. The mirrors are actually effective until x-ray energy of ~20 keV. The calculated photon flux and the energy resolution are presented in Fig.2 as a function of x-ray energy .

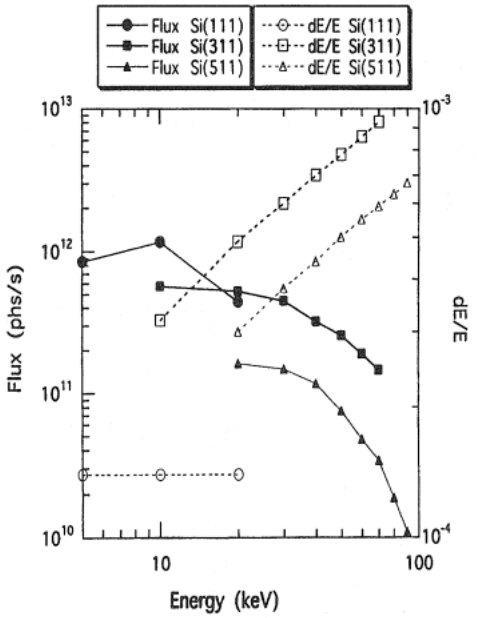

Fig.2. Calculated photon flux and energy resolusion at the sample position.

3. Experimental arrangement

The experimental hatch with the size of 5m (wide) × 7m (length) × 3. 5m (height) is installed at about 50m from the light source point. The standard measurement system of the XAFS spectra will be set up as the first step. The detailed configuration of the measurement apparatus is shown in Figs. 3 and 4. The translation part of those such as ionization chambers, a sample station and a cryostat is constructed by two parallel linear guides and one crossing linear guide to obtain high stiffness. A table top is made of aluminium honeycomb structure with a high eigen frequency more than 100Hz. The x-ray intensity is detected by three ionization chambers (17cm, 31cm, and 62cm in length) with a low noise current pre-amplifier. Those will be bring the high S/N ratio more than 80 dB .

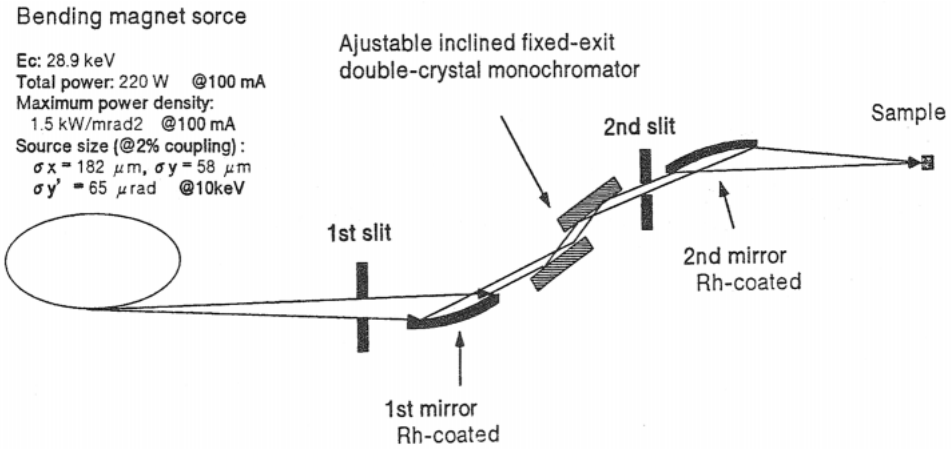

Fig.1 . Schematic diagram of the beamline optics.

For observation of XAFS spectra at higher energy region than about 60 keV, a closed type filled by Xe gas at two atmosphere pressure is used.

The table top, the final slits, and the sample stages are controlled by computer system. The adequate tables for adjusting the optimum condition of the optics and of the sample position will be prepared.

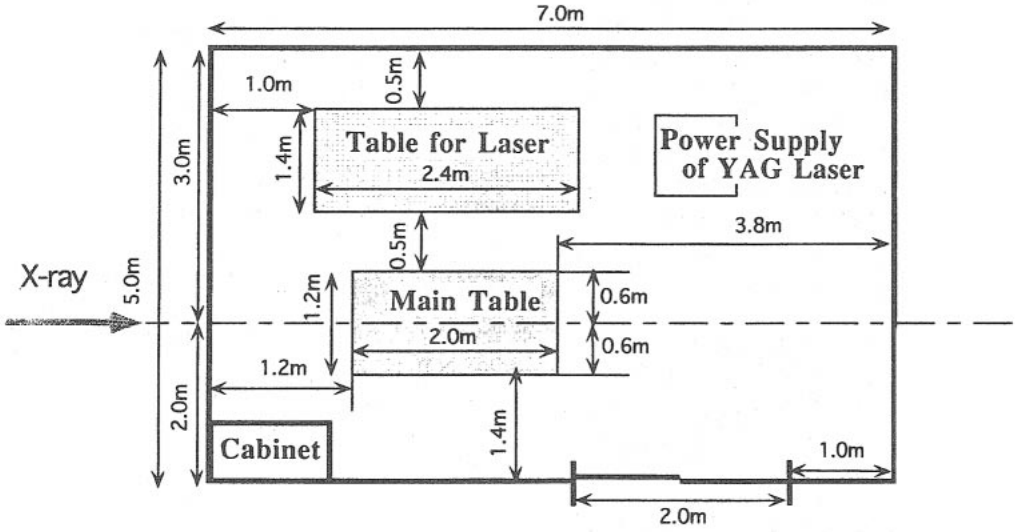

Fig.3. Top view of the experimental station

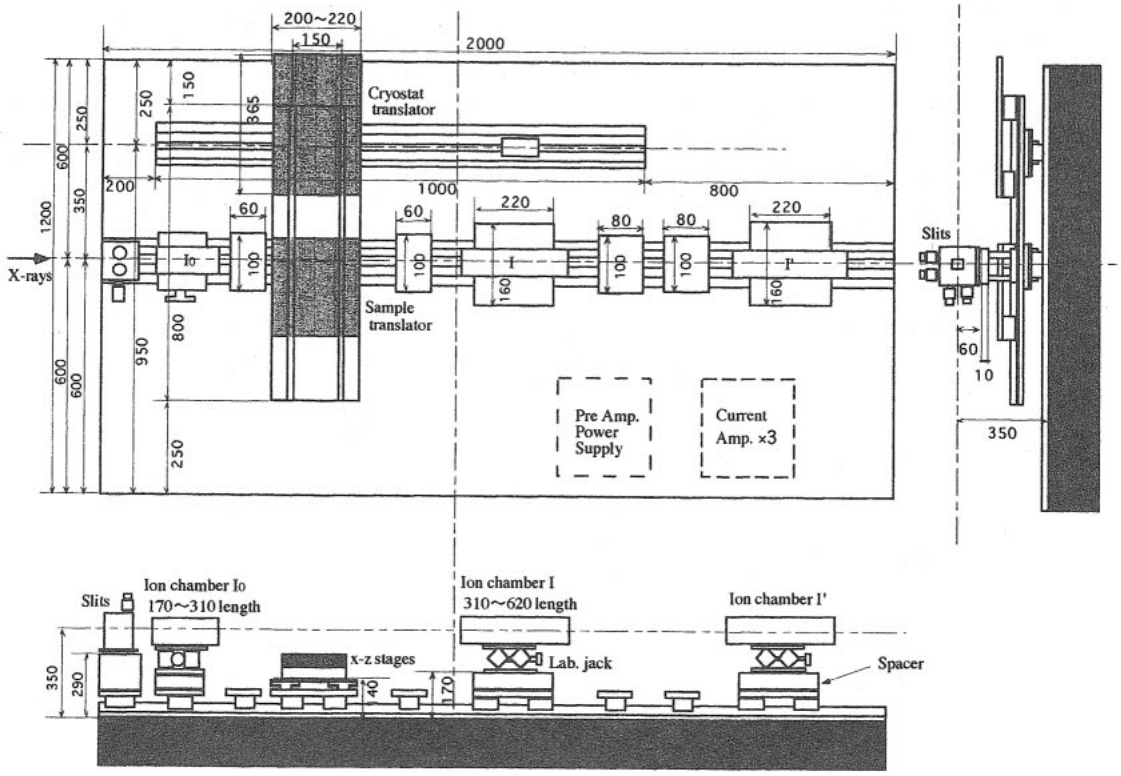

Fig.4. The geometrical arrangement of the XAFS measurement system.